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6-0000 STORM DRAINAGE

6-0100 GENERAL INFORMATION

6-0101 Drainage Systems

6-0101.1 It is the intent of § 6-0000 et seq. to require that public facilities meet or exceed applicable drainage laws.

6-0101.2 The overall drainage system is divided into 2 parts, the minor system and the major system.

6-0101.2A The minor drainage system (normally designed for the 10-yr storm) consists of storm sewer appurtenances and conduits such as inlets, manholes, street gutters, roadside ditches, swales, small underground pipe and small channels which collect the stormwater runoff and transport it to the major system.

6-0101.2B The major system (designed for the less frequent storm up to the 100-yr level) consists of natural waterways, large man-made conduits, and large water impoundments. In addition, the major system includes some less obvious drainageways such as ~~overload~~overland relief swales and infrequent temporary ponding at storm sewer appurtenances. The major system includes not only the trunk line system which receives the water from the minor system, but also the natural backup system which functions in case of overflow from or failure of the minor system. ~~Overland relief must not flood or damage houses, buildings or other property.~~(See § 6-1500 et seq.)

6-0101.3 Special attention is invited to:

6-0101.3A The current Virginia E&S Control Handbook and the Virginia Stormwater Management Handbook Volumes I & II. These handbooks addresses State criteria for stormwater management to be applied to control flooding and erosion.

6-0101.3B Planning Bulletin 319, "BMPs for Hydrologic Modifications," published by DEQ. The bulletin is a guide to be used whenever modifications to flowing streams are proposed.

6-0101.3C Engineering Properties of Fairfax County Soils, published by Fairfax County Department of Public Works and Environmental Services.

6-0101.3~~C~~D Copies of the handbooks, ~~and~~ the bulletin and the soils document are available for viewing ~~in~~at the Department of Public Works and Environmental Services~~Office of Site Development Services, DPWES~~.

6-0102 VDOT Requirements. See § 1-0602 et seq. regarding VDOT Standards.

6-0103 Metric Requirements. Until hydraulic and hydrologic design aids are available in metric units, design computations may continue to be performed in English units with the description of proposed structures converted to metric after computations are complete.

6-0200 POLICY AND REQUIREMENTS FOR ADEQUATE DRAINAGE

6-0201 Policy of Adequate Drainage

6-0201.1 In order to protect and conserve the land and water resources of this County for the use and benefit of the public, measures for the adequate drainage of surface waters shall be taken and facilities provided in connection with all land development activities. (See also § 2-602 of the Zoning Ordinance).

6-0201.2 Adequate drainage of surface waters means the effective conveyance of storm and other surface waters through and from the development site and the discharge of such waters into a natural watercourse, i.e., a stream with a defined~~incised~~ channel (bed and banks), or man-made drainage facility of sufficient capacity without adverse impact upon the land over which the waters are conveyed or upon the watercourse or facility into which such waters are discharged. (See § 6-0202 et seq.)

6-0201.3 The provision of the necessary onsite and offsite easements to accomplish this also shall be required. These are to include sufficient easement extensions to property lines to permit future development reasonable access to drainageways or drainage facilities for connections.

6-0202 Minimum Requirements

~~6-0202.1 The drainage system must have the hydraulic characteristics to accommodate the maximum~~

~~expected flow of surface waters for a given watershed, or portion thereof, for the duration and intensity of rainfall, as specified in § 6-0000 et seq.~~

6-0202.1~~2~~ Determination of the size and capacity of the drainage system shall be based on the planned development, existing zoning or existing development, whichever is greater, within the watershed.

6-0202.2~~3~~ The drainage system shall be designed:

6-0202.2~~3~~A To honor natural drainage divides for both concentrated and non-concentrated stormwater runoff leaving the development site. If natural drainage divides cannot be honored, each diversion from one drainage area to another may be approved by the Director in accordance with the following conditions:~~.~~

6-0202.3A(1) The increase and decrease in discharge rates, volumes, and durations of concentrated and non-concentrated stormwater runoff leaving a development site due to the diverted flow shall not have an adverse impact (e,g, soil erosion; sedimentation; yard, dwelling, building, or private structure flooding; duration of ponding water; inadequate overland relief) on adjacent or downstream properties.

6-0202.3A(2) The applicant shall demonstrate to the satisfaction of the Director that the diversion is necessary to: a) improve an existing or potentially inadequate outfall condition; b) preserve a significant naturally vegetated area or save healthy, mature trees, which otherwise could not be preserved or saved, and which may be used to meet tree cover requirements instead of newly planted trees; c) maximize the water quality control and/or water quantity control provided; d) address constraints imposed by the dimensions or topography of the site to preclude adverse impacts from steep slopes and/or runoff; or e) minimize to a reasonable extent, as determined by the Director, the number of on-site stormwater management facilities.

6-0202.3A(3) The construction or grading plan shall include a written justification for the proposed diversion and a detailed analysis of both concentrated and non-concentrated stormwater runoff leaving a development site for each affected downstream drainage system in accordance with the requirements of § 6-0203. The extent of downstream analysis shall be performed to a point where the diverted flow is returned to its natural course. However, the analysis for a non-bonded lot grading plan proposing a diversion of less than 0.5 CFS for the 10-year design storm may be terminated at a point that satisfies § 6-0203.2, if that point is upstream of the point where the diverted flow is returned to its natural course. Otherwise, the extent of downstream review shall be performed to a point where the diverted flow is returned to its natural course and in accordance with § 6-0203, and whichever point results in the furthest downstream review shall govern.

6-0202.3A(4) A diversion shall not be approved if it adversely impacts the adequacy of downstream drainage systems; creates new floodplain areas on adjacent or downstream properties; alters Resource Protection Area boundaries; aggravates or creates a non-compliance with provisions governing elevations and proximity to 100-year water surface elevations; changes the drainage area at points where perennial streams begin; or changes the total drainage area of a watershed depicted on the County map of Watersheds, as may be amended.

6-0202.2~~3~~B To account for both off-site and on-site surface waters.

6-0202.2~~3~~C To convey such waters to a natural water course at the natural elevation, or an existing storm drainage facility. (See § 6-201.2.)

6-0202.2~~3~~D To discharge the surface waters into a natural watercourse or into an existing or proposed man-made drainage facility of adequate capacity except as may be provided for in § 6-0203.

6-0202.3 Concentrated stormwater runoff leaving a development site shall be discharged directly into an adequate natural or man-made receiving channel, pipe or storm sewer system or the developer must provide a drainage system satisfactory to the Director to preclude an adverse impact (e.g. soil erosion; sedimentation; yard flooding; duration of ponding water; inadequate overland relief) on downstream properties and receiving channels in accordance with § 6-0203, as well as a proportional improvement of the predevelopment conditions (§ 6-0203.4 and § 6-0203.5). If the developer chooses to install a storm drainage system, the system shall be designed in accordance with established, applicable criteria for such systems.

~~6-0202.4 The drainage system shall be designed such that properties over which the surface waters are conveyed, from the development site to discharge point(s), are not adversely affected.~~

6-0202.4 Concentrated stormwater runoff leaving a development site shall not aggravate or create a condition where an existing dwelling or a building constructed under an approved building permit floods from storms less than or equal to the 100-year storm event. If such a dwelling or building exists, detention for the 100-year storm event shall be provided in accordance with § 6-0203.5.

6-0202.5 Concentrated surface waters shall not be discharged on ~~adjoining~~ adjacent or downstream property, unless an easement expressly authorizing such discharge has been granted by the owner of the affected land or unless the discharge is into a natural watercourse, or other appropriate discharge point as set forth above.

6-0202.6 The owner or developer may continue to discharge stormwater which has not been concentrated (i.e. sheet flow) into a lower lying property if:

6-0202.6A The peak rate after development does not exceed the predevelopment peak rate; or

6-0202.6B(1) The increase in peak rate or volume caused by the development will not have any adverse impact (e.g. soil erosion, sedimentation, duration of ponding water, inadequate overland relief) on the lower lying property as determined by the Director; and

6-0202.6B(2)~~C~~ The increase in peak rate or volume caused by the development will not aggravate any~~re is no~~ existing drainage problem or cause a new drainage problem on the downstream property.

6-0202.7 Increases in peak rates or volumes of sheet flow that may cause any adverse impact on lower lying properties shall be discharged into an adequate existing drainage system or the developer shall provide an adequate drainage system satisfactory to the Director to preclude any adverse impact upon the adjacent or downstream property.

~~6-0202.7 If the discharge conditions are not met and the discharge may aggravate an existing drainage problem or cause a drainage problem, the developer must provide a drainage system satisfactory to the Director, to preclude an adverse impact upon the adjacent or downstream property.~~

6-0202.8 (31-90-PFM) Drainage structures shall be constructed in such a manner that they may be maintained at a reasonable cost. To facilitate design, construction, and maintenance, drainage facilities shall meet and conform, insofar as practical, to County and VDOT standards. However, small private drainage systems may be acceptable (See § 6-020~~5~~4) for solving ~~existing~~ drainage problems that may develop during the course of construction of a new development or for implementation by property owners in existing developments. See § 6-~~0204~~0205 and Plate 1-6 (1M-6) for construction details and example.

~~6-0202.9 (52-96-PFM) If the outfall is into a natural and well-defined, stabilized watercourse, the 2-yr peak flow from the development of the watershed must be at a flow rate and velocity which the watercourse can handle without erosion or over-bank flooding. Alternatively, if the developer chooses, the downstream watercourse may be modified so that it can handle the 10-yr post-development flow. However, if the developer chooses to install a storm drainage system, the system shall be designed in accordance with established, applicable County criteria for such systems.~~.

6-0202.9~~10~~ If off-site downstream construction and easements are necessary~~ to obtain an adequate outfall~~, no plans shall be approved until such storm drainage easements~~, extending to the nearest natural and well-defined, adequate, stabilized watercourse, or adequate man-made drainage channel or pipe,~~ have been obtained and recorded. If the downstream owner or owners refuse to give or to sell such easements, the owner or developer may request condemnation of the easements by the County at the developer's cost. If the County declines to institute condemnation, the plan shall not be approved.

6-0202.10~~11~~ Storm sewers shall be discharged into the area least likely to erode.

6-0202.10A~~11A~~ Generally, it is better to discharge at the floodplain limit into an adequate watercourse channel leading to the main streambed, rather than disturb the floodplain by extending the storm sewer.

6-0202.10B~~11B~~ If an adequate watercourse channel does not exist, the only alternative is to discharge into the main streambed.

6-0202.10C~~11C~~ In either case, energy dissipation devices are required.

6-0202.110~~2~~ The requirements of Chapter 104, (Erosion and Sedimentation Control) of the Code, and the further requirements for protection of streambeds by detention-retention of surface waters, set forth in § 6-0000 et seq. must be satisfied. Additionally, BMP requirements to protect water quality must be met, if applicable (§ 6-0400 et seq.).

6-0202.12~~3 All drainageways, including overland relief pathways, must be separated from buildings. (See § 6-1503).~~ The on-site major storm drainage system must be designed in accordance with § 6-1500 et seq.

6-0202.13~~4~~(27-89-PFM) Consideration must be given in the preparation of the plans to preclude adverse impacts due to higher rates and volumes of flow that will occur during construction. Special consideration shall be given to the design of sediment traps which discharge into existing residential yards. In this case, in order to reduce concentrated flows and simulate existing sheet flow conditions, the 10-yr peak discharge shall be designed to be not greater than 0.5 CFS (0.014 CMS) using a minimum runoff C factor of 0.6 for all areas to be disturbed.

6-0202.14~~5~~ In those cases in which the drainage plans of a proposed development do not satisfy these minimum requirements because necessary off-site facilities or improvements are lacking, the developer shall delay development until the necessary off-site facilities or improvements are constructed or other arrangements, satisfactory to the Director, are made.

~~6-0202.15A In such event, the plat or plans, if otherwise satisfactory, will be approved when the requirements of § 6-0000 et seq. are satisfied.~~

~~6-0202.15B Alternatively, the developer may choose to supply the off site facilities that are necessary for adequate drainage.~~

6-0203 Analysis of Downstream Drainage System

6-0203.1 The downstream drainage system shall be analyzed to demonstrate the adequacy of the system (§ 6-0203.3), or it shall be shown that there is no adverse impact to the downstream system as well as a proportional improvement of the predevelopment conditions (§ 6-0203.4 and § 6-0203.5)

6-0203.2 The extent of the review of the downstream drainage system shall be:

6-0203.2A To a point that is at least 150 ft (46 meters) downstream of a point where the receiving pipe or channel is joined by another that has a drainage area that is at least 90% of the size of the first drainage area at the point of confluence; or

6-0203.2B To a point at which the total drainage area is at least 100 times greater than the contributing drainage area of the development site; or

6-0203.2C To a point that is at least 150 ft (46 meters) downstream of a point where the drainage area is 360 acres (1.46 km^2) or greater.

6-0203.2D When using §§ 6-0203.2A and 6-0203.2C for the extent of review, the analysis must be to a point where all the cross-sections are adequate in the farthest downstream reach of 150 feet . A minimum of three cross-sections shall be provided in the 150-foot reach. If the detention method described in §6-0203.4C is used, the three cross-sections in the farthest downstream reach of 150 feet shall be limited to showing a defined channel or a man-made drainage facility and checking for flooding as described in § 6-0203.4C(3) and § 6-0203.5.

6-0203.2E The Director may require analysis farther downstream when the submitted narrative described in § 6-0204 and all related plats and plans are insufficient to show the true impact of the development on surrounding and other lower lying properties, or if there are known drainage problems downstream.[1]

6-0203.2F Cross-section selection and information shall be determined in accordance with Chapter 5 of the latest edition of the Virginia Erosion and Sedi-

[1] These drainage problems may be documented as parts of County watershed or drainage studies, complaints on file with the County, or complaints on file at the offices of County Supervisors.

ment Control Handbook (Virginia Department of Conservation and Recreation) under the section titled "Determination of Adequate Channel." Cross-sections shall be shown on the plans with equal horizontal and vertical scales.

6-0203.2G If the downstream owner(s) refuse to give permission to access the property for the collection of data, the developer shall provide evidence of this refusal and make arrangements satisfactory to the Director to provide an alternative method for the collection of data to complete the outfall analysis (e.g., through the use of photos, aerial surveys, "as built" plans, County topographic maps, soils maps, and any other relevant information).

6-0203.3 Adequacy of all natural watercourses, channels and pipes shall be verified as follows:

6-0203.3A The developer shall demonstrate that the total drainage area to the point of analysis within the channel is 100 times greater than the contributing drainage area of the development site; or

6-0203.3B(1) Natural watercourses shall be analyzed by the use of a 2-year frequency storm to verify that stormwater will not overtop channel banks nor cause erosion of channel bed or banks;

6-0203.3B(2) All previously constructed man-made channels shall be analyzed by the use of a 10-year frequency storm to verify that stormwater will not overtop channel banks and by the use of a 2-year frequency storm to demonstrate that stormwater will not cause erosion of channel bed or banks;

6-0203.3B(3) Pipes, storm sewer systems and culverts, which are not maintained by VDOT, shall be analyzed by the use of a 10-year frequency storm to verify that stormwater will be contained within the pipe, system, or culvert; and

6-0203.3B(4) Pipes, storm sewer systems and culverts, which are maintained by VDOT, shall be analyzed by the use of the 10-year or greater frequency storm in accordance with VDOT requirements.

6-0203.3C Determinations of the adequacy of drainage systems shall be performed in accordance with methods contained in Chapter 5 of the latest edition of the Virginia Erosion and Sediment Control Handbook (Virginia Department of Conservation and Recreation) under the section titled "Determination of Adequate Channel."

6-0203.4 A proportional improvement and no adverse impact to the downstream drainage system shall be shown by one of the following methods:

6-0203.4A Critical Shear Stress Method

6-0203.4A(1) If the outfall is inadequate due to erosive velocities along the extent of review, which is described in § 6-0203.2, the critical shear stress method may be used to show no adverse impact due to erosive velocities. The erosive work on the channel for the post-development conditions shall be reduced to a level below the erosive work on the channel under pre-development conditions by the required proportional improvement. The required proportional improvement of the downstream system at each inadequate cross-section is the ratio of the post-development C times A (see § 6-0803 for a description of C times A) for the contributing drainage area of the site to the existing development C times A for the entire drainage area at that cross-section. The required proportional improvement is computed as follows:

$$P_i = [C_d A_d / C_{cs} A_{cs}] \times 100 \text{ where,}$$

P_i = Required Proportional Improvement (%)
C_d = Runoff Coefficient for the Contributing Drainage Area of the Site in a Post-development Condition
A_d= Contributing Drainage Area of the Site
C_{cs} = Runoff Coefficient for the Contributing Drainage Area to the Cross-section in a Existing Development Condition
A_{cs}= Contributing Drainage Area to the Cross-section

Each inadequate cross-section along the extent of review shall then be analyzed for the following:

6-0203.4A(2) The shear stress for both the predevelopment condition and the post-development condition for the 2-year storm shall be plotted in relation to time at each cross-section. On each graph, the permissible shear stress also shall be plotted. The permissible shear stress is based on the soil type, and may be determined for cohesive soils from Plate 76-6 (Plate 76M-6) and for non-cohesive soils from Plate 77-6 (Plate 77-M-6). The soil type may be determined by field test or the soil type designated on the County soils maps may be used. If the soil type is

designated using the County soils maps, the most conservative permissible shear stress for the soil type shall be used. The plans shall indicate how the soil type was determined. The area between the permissible shear stress and the actual shear stress on the graph is erosive work on the channel. The erosive work for the post-development condition shall be less than the erosive work for predevelopment condition by a percentage equal to the required proportional improvement.

The shear stress on the channel can be calculated using the following formula:

$\tau = \gamma RS$ where,

τ = shear stress in lb/sq.ft. (N/m^2)
γ = unit weight of water is 62.4 lb/ft^3 (9810 N/m^3)
R = hydraulic radius in ft (m)
S = slope of the channel bed

6-0203.4B Channel Capacity Method

6-0203.4B(1) If the outfall is inadequate due to inadequate capacity along the extent of review, which is described in § 6-0203.2, the channel capacity method may be used to show no adverse impact due to overtopping. The largest storm that does not exceed the actual channel, pipe, or culvert capacity under pre-development conditions shall be determined for the cross-section that is most frequently over its capacity. The post-development peak flows for the above storm and the 2-year and 10-year storms shall be reduced to a level below the pre-development conditions by a percent equal to the required proportional improvement. See § 6-0203.4A(1) for a description of the required proportional improvement.

6-0203.4C Detention Method [2]

6-0203.4C(1) It shall be presumed that no adverse impact and a proportional improvement will occur if on-site detention is provided as follows and the outfall is discharging into a defined channel or man-made drainage facility:

6-0203.4C(1)(i) Extended detention of the 1-year storm volume for a minimum of 24 hours. If extended detention of the BMP volume (see § 6-0400 et seq.) also is provided, the 24 hours shall be applied to the difference between the 1-year storm volume and the BMP volume; and

6-0203.4C(1)(ii) In order to compensate for the increase in runoff volume, the 2-year and 10-year post-development peak rates of runoff from the development site shall be reduced below the respective peak rates of runoff for the site in good forested condition (e.g., for NRCS method, a cover type of "woods" and a hydrologic condition of "good"). This reduction results in a proportional improvement and is computed as follows:

$R_i = [1 - (V_f / V_d)] \times 100$ where,

R_i = Reduction of Peak Flow Below a Good Forested Condition (%)
V_f = Runoff Volume from the Site in a Good Forested Condition
V_d= Runoff Volume from the Site in a Post-Developed Condition

The calculation of the cumulative volumes shall be based on the NRCS (formerly SCS) methodology described in § 6-0802 or other methods as approved by the Director.

6-0203.4C(1)(iii) Computations demonstrating the 1½-year post-development peak rate of runoff from the development site does not exceed the 1½-year peak rate of runoff for the site in good forested condition are optional. The 1½- year storm is used to obtain Leadership in Energy and Environmental Design (LEED) certification.

6-0203.4C(2) If this method is used, each outfall from the site shall be analyzed independently and the allowable release rate shall be based on the area of the site that drains to the outfall under predevelopment conditions.

6-0203.4C(3) If this method is used, the downstream review analysis shall be limited to providing cross-sections to show a defined channel or man-made

[2] Because of the long detention times resulting from this method, consideration shall be given to hydrology, soils and extended detention when choosing the appropriate landscaping for the detention facility.

drainage facility, and checking for flooding of existing dwellings or buildings constructed under an approved building permit from the 100-year storm event for the extent of review described in § 6-0203.2A, B , C and D.

6-0203.4D Other scientifically valid methods, which show no adverse impact regarding erosion or capacity for an inadequate outfall and show proportional improvement, may be approved by the Director.

6-0203.5 In accordance with § 6-0202.4, if an existing dwelling or a building constructed under an approved building permit, which is located within the extent of review described in § 6-0203.2, is flooded by the 100-year storm, the peak flow of the 100-year storm at the development site shall be reduced to a level below the pre-development condition by a percent equal to the required proportional improvement. See § 6-0203.4A(1) for a description of the required proportional improvement.

6-0203~~4~~4 Submission of Narrative Description

6-0203~~4~~4.1 In addition to plats, plans, and other documents that may be required, a description of ~~the~~each outfall of the storm drainage system ~~and of non-concentrated discharge(s) of surface waters~~ from the development site shall be submitted as part of the relevant subdivision construction plan or site plan and shall include the following: ~~unless § 6-0203.8 applies.~~

6-0203~~4~~4.1A The additional submission shall include a narrative~~, computations~~ and sketches describing the major elements (pipe, channel, natural watercourse stream, etc.) of ~~the~~each outfall drainage system~~(s)~~, including any discharges of non-concentrated surface waters from the development site. Photographs may also be included to assist in the description of the outfall.

~~6-0203.1B The downstream review, divided into reaches, shall note the existing surrounding topography, soil types, embankments, vegetation, structures, abutting properties, etc., which may be impacted by drainage and shall conclude with a written opinion, signed and sealed by the designer as to the adequacy of the downstream system(s) for the critical storm return period.~~

6-0204.1B Downstream Review

The downstream review, divided into reaches, as required by § 6-0203, shall:

6-0204.1B(1) Note the existing surrounding topography, soil types, embankments, vegetation, structures, abutting properties, etc., which may be impacted by drainage;

6-0204.1B(2) In cases where the developer seeks to establish that the existing downstream facilities and/or natural waterways are adequate to receive the drainage from the development site, provide sufficient cross-section information, associated graphs, and computations to support the assertion of adequacy, in accordance with § 6-0203.3;

6-0204.1B(3) In cases where the downstream facilities are inadequate and the developer proposes to use the detention method, in accordance with § 6-0203.4C, provide sufficient information to (i) establish the existence of a defined channel or man-made drainage facility to receive the concentrated discharge from the development site, and (ii) demonstrate at least the minimum required proportional improvement, as described in § 6-0203.4C(1), will be achieved;

6-0204.1B(4) In cases where the downstream facilities are inadequate and the developer proposes to use the critical shear stress or channel capacity method, in accordance with § 6-0203.4A and § 6-0203.4B, provide sufficient cross-sections, associated graphs, and computations to demonstrate (i) there will be no adverse impacts and (ii) at least the minimum required proportional improvement, as described in § 6-0203.4A(1), will be achieved;

6-0204.1B(5) Provide sufficient information to demonstrate that (i) there will be no flooding of existing dwellings, or buildings constructed under an approved building permit, by the 100-year storm event, or (ii) any existing flooding condition will not be aggravated by drainage from the development site and a proportional improvement is made in accordance with § 6-0203.5; and

6-0204.1B(6) Include a written opinion, certified, signed, and sealed by the submitting professional, that (i) the requirement of adequacy of the downstream drainage system(s) is met or the development

will meet the no adverse impact condition and achieve the required proportional improvement of predevelopment conditions; (ii) if any portion of the outfall drainage system is a natural watercourse, the cross-sections analyzed and included on the plan are representative of stream reaches for the entire extent of review for the natural watercourse portion of the system; and (iii) there will be no flooding of existing downstream dwellings, or buildings constructed under an approved building permit, by the 100-year storm event, or that any existing flooding condition will not be aggravated by drainage from the development site.

~~6-0203.2 Where erosion is an issue, the critical storm return period referred to in § 6-0203.1B normally would be the 2-yr storm.~~

~~6-0203.3 Where an existing facility is at issue (such as storm sewer system, highway culvert, etc.), the critical storm return period would be that storm return frequency which begins to exceed the capacity of the existing facility up through the normal design standard for that type of facility (such as 10-yr for storm sewer, 25-yr for primary highway culvert, etc.).~~

~~6-0203.4 Where house flooding is involved, the critical storm return period normally would be the storm that begins to flood the structure up through the 100-yr flooding event.~~

~~6-0203.5 Where open streams are involved, the designer must assess the stream adequacy to receive the 2-yr runoff without causing erosion or overbank flooding using the methodology as outlined in the current edition of the Virginia E&S Control Handbook.~~

~~6-0203.6 The downstream extent of this review shall be:~~

~~6-0203.6A To the point at which an adequate channel[1] is found; or~~

~~[1]An adequate channel shall be defined as a natural or man-made channel or pipe which is capable of conveying the runoff from a 2-yr storm without overtopping its banks or eroding after development of the site in question, or without causing the flooding of structures from the 100-yr storm event.~~

~~6-0203.6B To the point at which the total drainage area is at least 100 times greater than the area of the development site in question; or~~

~~6-0203.6C To the limit of the nearest 100-yr floodplain, as adopted by the Board, which has a contributing area of 1 mi.^{2} (2.59 km^2) or more.~~

~~6-0203.7 The Director may require further downstream analysis when the submitted narrative and all related plats and plans are insufficient to show the true impact of the development on surrounding and other lower lying properties.~~

~~6-0203.8 The narrative description may be omitted when the storm sewer discharge is into a pipe or other drainage system meeting current design standards and the peak rates of non-concentrated flows onto adjoining properties are not increased by the development.~~

6-0204<u>5</u> Small Private Drainage System (See Plate 1-6 (1M-6)) (31-90-PFM)